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A SUMMER CRUISE IN THE WEST INDIES

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INTRODUCTION

Need of rest, and a renewed interest in the West Indian region because of the preparation (in collaboration with Prof. Charles F. Brooks) of the chapter on the climatology of the West Indies for the new Köppen-Geiger *Handbuch der Klimatologie*, were the reasons for taking a month's cruise to the Lesser Antilles during the summer of 1931.

The instrumental equipment was purposely reduced to a minimum—a pair of traveling pocket dry and wet bulb thermometers and a small-size Richard barograph. This latter instrument went with the writer around South America in 1897–98, on the International Ice Patrol in 1923, and around the world by sea in 1929. In addition, copies of the latest United States Hydrographic Office Pilot Charts of the North Atlantic and of the Central American waters were also taken. No attempt was made to take regular observations at fixed hours. The thermometers were read and record of wind, cloudiness, etc., was made, when and as such observations were convenient and seemed desirable.

As it was my desire to visit some of the smaller and less well-known islands, one of the Canadian national steamships of the "Lady" class, assigned to the so-called eastern route, was chosen as best and most conveniently fulfilling the requirements. The regular schedule includes calls at Bermuda, St. Kitts, Nevis, Antigua, Montserrat, Dominica, St. Lucia, Barbados, St. Vincent, Grenada, and Trinidad, with the terminal port at Georgetown (Demarara), British Guiana. The same ports, in the reverse order, are touched on the return voyage. The round trip takes one month.

GENERAL GEOGRAPHY

The islands comprising the West Indian archipelago form a natural breakwater on the eastern border of the Caribbean Sea and the Gulf of Mexico, reaching from latitude 10° No. (Trinidad) to somewhat beyond the Tropic of Cancer (Bahamas). As a whole, these islands form a more or less regular arc or parabola, stretching from Yucatan and Florida to the coast of Venezuela. The Greater Antilles—Cuba, Haiti, and Santo Domingo, Jamaica, and Porto Rico—extend eastward from off Yucatan. The Lesser Antilles extend from east of Porto Rico to the Orinoco Delta in a sweeping curve slightly convex to the east. Trinidad, the southernmost of this group, is really a detached portion of the South American Continent.

The West Indies include an immense number of islands and islets, ranging in size from the larger ones with mountains of considerable elevation and elevated plateaus to the smallest rocks and keys which hardly rise above the surface of the sea. The islands differ from one another, not only in size but also in detailed physical characteristics and in population. The highest mountains are in the northern islands, while the volcanoes, whether active or dormant, are in the Lesser Antilles. With the exception of the Bahamas, the large majority of the islands are mountainous. Several are distinctly rugged. The western or interior zone of the Lesser Antilles is volcanic. The outer zone from the Bahamas to Barbadoes, is limestone. In Guadeloupe, which is volcanic in the west and limestone in the east, the two formations converge. The soils of the volcanic islands are wonderfully fertile and support luxuriant vegetation. The limestone islands, whose soils are generally less fertile, are regarded as "healthier" and are obviously subject to fewer dangers.

The use of the names Windward and Leeward for two divisions of the Lesser Antilles group is of interest to the climatologist. These terms are naturally associated with the steadiness of the trade winds, just as many other geographical designations had their origin in meteorological or climatic characteristics. The application of the term Leeward to the northern members of the Lesser Antilles, and Windward to the southern islands would seem to be illogical and inappropriate. The more northerly islands are certainly farther to windward if the normal direction of the northeast trade is considered to be the controlling factor. On the other hand, as the prevailing direction of the trades is more or less easterly throughout much of the year over most of the islands, it would perhaps seem more logical to call the easternmost islands Windward and those to the west Leeward. As a matter of fact, the name Windward recalls the track followed to the Spanish Main in the old sailing ship days, and the real Leeward Islands are those off the north coast of South America. In the new Oxford Advanced Atlas (Bartholomew), while the names Leeward and Windward are shown for the northern and southern islands of the Lesser Antilles, respectively, the islands off the Venezuelan coast are designated "Leeward Islands (of the Spanish)." Officially, the British Leeward Islands include those between the Virgins and Dominica, and the Windward Islands extend from St. Lucia to the south.

HISTORY

Historically the West Indies region is full of interest, of romance, and of thrilling tales of the old pirate and buccaneer days. Columbus, on his first and most

famous voyage, reached the Bahamas (1492), and on his later voyages discovered most of the larger islands. The name West Indies perpetuates the original conviction of Columbus that he had discovered a western route to India, and the name Antilles recalls the fact that he was thought to have reached the fabled land of Antillia. Spain naturally claimed the whole archipelago, but she was not allowed to remain in undisputed possession. British and Dutch sailors were before long cruising in the West Indian waters. Spain began to lose ground, and toward the end of the seventeenth century relinquished her claim to exclusive possession. As the power of Spain declined, other nations gained foothold, notably the English, French, and Dutch, and later the United States. Political changes have been frequent, and are rather hopelessly confusing, many of the islands having changed hands more than once. Porto Rico became a United States possession after the war with Spain, and St. Thomas was later purchased by the United States from Denmark. These changes are, however, of comparatively little concern to the casual traveler, who is mainly interested in sailing over the tropical seas, in enjoying the charms of the tropical vegetation, and in visiting new scenes.

The earliest conquerors expected to find great wealth of precious metals in the islands, but in this hope they were disappointed. The abundance of gold and silver came from the mainland to the west, and the dispatch of treasure-laden ships to Spain naturally served as an irresistible attraction to pirates and buccaneers. Many names of the early navigators became famous in history, e. g., Sir Francis Drake and Sir John Hawkins, who came to the West Indies as privateers and died there. Other names also associated with these islands are Sir Walter Raleigh, Lord Nelson, Rodney Hood, Benbow, and others. Raleigh made his famous expedition to the Orinoco from the island of Trinidad. The Spanish Main was long infested by pirates and marauders—British, Dutch, and French. Legitimate trade suffered. Ordinary commerce could only be carried on under conditions of extreme danger and difficulty and by force of arms. Piracy finally became a decreasing menace in the earlier years of the eighteenth century, but it persisted, more or less sporadically, along the coasts as late as the early part of the nineteenth century.

The wealth of the West Indies has been in their agricultural resources, not in the output of precious metals. The extended and systematic cultivation of sugar-cane, from about the middle of the seventeenth century, marked the beginning of the prosperity of the islands, and was made possible by the introduction of African negro slave labor. From an economic point of view, slave labor was a success. In the slave traffic all the nations having possessions in the West Indies took part. The cessation of the traffic in slaves; the emancipation of the slaves; competition with European beet sugar whose production dated from the Napoleonic wars and was encouraged by bounties, and other political and economic factors, combined to bring about a gradual decline of West Indian prosperity in the nineteenth century. Labor became scarcer, more expensive, and less reliable. Fortunes were lost, and a long period of depression set in. More recently, with the introduction of other staple crops, diversified agriculture, and improved methods of cultivation, the general conditions have somewhat improved. Nevertheless, as is well known, tariff laws and regulations of other countries, and numerous political changes and upheavals of more recent days, have been serious handicaps in the development of sound and stable prosperity in these islands.

POPULATION

Chiefly because of the introduction of negro and other labor, the population of the West Indies has become very mixed. The great bulk of the people are still of pure African blood. European-negro mixture comes next; and there are also coolies from India, Chinese, and a very few aboriginal Carib Indians. The whites play the most important part in the administrative and commercial life of the archipelago, but are very distinctly in the minority.

CLIMATE

The larger climatic characteristics of the West Indian region are easily summarized. They are very simple and very uniform.[1] The climate is typically tropical, with great uniformity of temperature, and with normal modifications resulting from latitudinal, topographic, and insular controls. With the exception of the Greater Antilles, the islands are small and therefore the land effects are generally subordinate to those of the water. Near sea level over most of the area, the mean annual temperatures are between 77° and slightly over 80°; the means for the coolest month are mostly between a little over 70° and somewhat under 80°; those for the warmest month between 80° and a few degrees above 80°. The Lesser Antilles have mean annual (sea level) temperatures of 79° or thereabouts, running about 2° higher than those of the larger and more northerly and westerly islands of the Greater Antilles. The mean annual ranges are of the order of 3° to 5° in the southern islands and 10° or slightly more in the Bahamas and Cuba. In the Greater Antilles minima near sea level have mostly ranged between 50° and 60°; in the remaining islands, between 60° and 65° or slightly higher. The absolute maxima have run, in round numbers, between 90° and about 100°. In the mountainous islands relief from the heat of the lowlands may be found on the slopes and uplands, varying elevations providing a corresponding variety of climates.

The North Atlantic high-pressure belt lies to the north and northeast of the West Indies throughout the year. It has its greatest extent in summer, at which season there is a slight increase in pressures over the islands. The area lies well within the northeast trades and winds from northeast or east prevail, there being no noteworthy changes in direction. At many stations, and especially in the easternmost islands, the mean direction is fairly steadily easterly. With the advance of summer, east and southeast directions become more frequent, and the velocities are somewhat lower. Under favorable conditions of exposure and of topography, land and sea breezes are well developed in many places. On the windward sides of the islands the sea breeze increases the velocity of the on-shore trades during the daytime. Winds from the sea, whether normal trade or sea breeze or the two combined, help greatly to temper the heat on land. Gales rarely occur, the southern islands being especially free from them. Extreme velocities of 100 or more miles an hour have occurred during hurricanes.

Differences of rainfall rather than differences of temperature distinguish the seasons, this being a general characteristic of tropical climates. The rainfall is heavy, or at least abundant, nearly everywhere. The windward mountain slopes naturally have the largest amounts; the leeward slopes and the interiors are much drier. Under varying topographic controls, great contrasts

[1] For a detailed account, with numerous tables and a complete bibliography, see the sections on the West Indies, by R. DeC. Ward and Charles F. Brooks, in the new Köppen-Geiger *Handbuch der Klimatologie*. The numerical data given in the present paper are generalized.

are found within very short distances. In the Leeward Islands the mean annual rainfall is generally more than 45 inches; on most of the islands it is 80 inches or over; at the highest elevations it is more than 150 inches. In the Windward Islands it varies between a little over 40 inches to about 120 inches, several stations showing annual means well over the latter amount. The months of maximum and of minimum rainfall vary somewhat in different parts of the West Indies, as well as on the individual islands. The rainiest months are usually from June to November; the driest, from January to April. The pressures are then relatively high, and there is the greatest frequency of northerly winds. The rainy season is, in general, a double one, with maxima in May (June or July) and in October or November, corresponding to two periods of lower pressure. This is also the time of most active convection and of many thunderstorms. October, usually wetter than May, is the time of lowest pressure and of hurricane rains. As the trades are forced to ascend the mountains throughout the year, the windward slopes have rainfall in winter as well as in summer, especially at the greater elevations. The lee slopes and the interior portions of the mountainous islands have relatively dry winters. These receive the bulk of their rainfall in the warmer months, when convection is most active. The southern islands generally have their first maximum retarded to June, July, or even August, and the second to November. The general régime is therefore a drier season in late winter and spring, and a rainier season in summer and autumn.

Relative humidity averages between 70 per cent and 80 per cent, or even more. It is generally at its minimum in March or April, at the season of least rainfall, and at a maximum in the autumn, when the most rain falls. The air is naturally damper on the windward than on the leeward sides of the islands. Fog is practically unknown in the waters of the Spanish Main.

The only violent weather phenomenon is the hurricane. In late summer and autumn, toward the end of the rainy season, and much less often in early or midsummer, violent tropical cyclones occasionally visit portions of the West Indies group. They are most frequent in the northern islands. The most violent ones may cause a heavy loss of life, and do great damage to buildings and crops. In their season, they are a menace to navigation. The more southern islands are rarely visited by them.

The available date regarding thunderstorms are scattering and incomplete. From November to April there are very few such storms, and over the smaller islands they are practically unknown between January and April. May and June show a marked increase in frequency, with a maximum in July to September.

The winter will doubtless always be the popular season for northern tourists in the West Indies, yet climatically the "winter" and the "summer" are so much alike that there is but little to distinguish them from one another, at least in so far as the temperatures are concerned. This is especially true of the Lesser Antilles, and notably so of the southernmost islands. The "summers" are there practically the same as the "winters," although the absolute maximum temperatures run a little higher in the "high sun" season. The Greater Antilles, farther north and nearer the continent, have slightly more marked temperature differences between the seasons. During the winter months the minima are somewhat lower there than farther south, and occasional importations of greatly tempered "cool waves" from the continent reach these islands, as in the case of the "northers" of Cuba. On the mountain slopes of the well-known Greater Antilles the climate is naturally cooler and more invigorating, especially in winter, than in the case with the coasts of the southern islands of the Lesser Antilles. It is, however, a mistaken but very widespread popular notion that summer is a wholly impossible season for visiting the West Indies. The statement in a standard publication of recent date, that the heat increases in July "to an extent well-nigh unbearable" is misleading. The summer months are, it is true, generally more rainy than those of winter, and the occasional hurricanes of late summer and autumn are certainly somewhat repellent. Yet rain occurs more or less frequently in all months, and hurricanes are fortunately few, and usually far between. The desire to escape from cold, and snow, and ice, and rough weather will, however, always tempt northerners to crave the bright sunshine, blue seas, and balmy air of the Spanish Main in winter. The summer provides sufficient heat and pleasant outdoor conditions in the homeland. The great American trek in summer is northward to the mountains, seashore, and lakes, or eastward across the North Atlantic, not southward to the everlasting summer of the Tropics.

SUMMARY OF WEATHER CONDITIONS AT SEA JULY 9 TO AUGUST 6, 1931

The following notes were made from day to day during the cruise, and were written up at sea. No attempt has been made to consult reference books or to verify every statement.

I have often been asked what interest there can possibly be in traveling over seas and to lands whose weather conditions and climates are already well known, and have been described by previous writers. The answer is very simple. Between seeing a condition which is presented graphically on a chart or reading a description of it in print, and actually feeling and observing the same condition one's self, there is all the difference between the dead fact and the living reality; between a mere quotation and the vivid recollection of a personal experience. "Wandering in search of weather" is a fascinating pursuit, in which everyone who attempts to teach the science of the earth's atmosphere should engage whenever possible. Furthermore, weather types and climatic conditions, wherever met with, almost always present certain aspects which did not attract the attention of previous observers. Hence the thrill of possible discovery always stimulates the "weather hunter." On this particular voyage there was the added interest of visiting the places at which the longest and best series of meteorological records have been kept in the islands at which stops were made—records which, in connection with recent work on the climatology of the West Indies, proved of great value. Basseterre (St. Kitts), Charlestown (Nevis), St. Johns (Antigua), Plymouth (Montserrat), Roseau (Dominica), Castries (St. Lucia), Bridgetown (Barbados), Kingstown (St. Vincent), St. George (Grenada), Port of Spain (Trinidad), were all familiar names, as was Georgetown (British Guiana).

To give anything more than a very brief summary of the observations made on the trip would weary the reader and would serve no useful purpose, although taking these observations added greatly to the interest of the cruise.

A barograph is a most welcome companion on an ocean voyage, whether it be in the stormy belts of the prevailing westerlies or in the uniform pressure conditions of the trades or doldrums. That wonderful double

diurnal maximum and minimum, traced day after day with clocklike regularity in the Tropics, never ceases to have a fascination for me. My collection of barograph curves, traced during previous ocean voyages, contains many weeks' sheets showing this remarkably uniform diurnal variation. The story of the pressure record made by the barograph on the present trip is easily told. The highest point on the outward voyage was reached near Bermuda (30.2 inches, uncorrected). From the crest of the North Atlantic high there is a slow decrease toward the equatorial low-pressure belt to the south. This was clearly indicated on the barograph curve. A pressure of about 30 inches was reached near the central portion of the Lesser Antilles. From there to the north the readings were somewhat higher; to the south, somewhat lower. The diurnal variation, faintly perceptible about 2° to 3° south of Bermuda, was marked throughout the whole trip from about 28° N. to Demerara and back. The lowest readings were between 29.75 inches and 29.8 inches (uncorrected), in Demerara. Between Boston and Bermuda the winds on the outward voyage were southeast. Soon after leaving Bermuda, and throughout the whole voyage to British Guiana and back, the ship was in the northeast trades. The northern limit of these winds (about lat. 28° N. in July) was passed without any change in wind direction. In this western part of the North Atlantic in summer the trades blow prevailingly from points between east and south-southeast, as is consistent with the rotary anticyclonic outflow on the western side of the North Atlantic high. The winds south of the northern limits of the northeast trade were Northeast, East, or Southeast, mostly of force 3 or 4, occasionally with higher velocities during squalls. There were also a few days with very light breezes. The southern limits of the northeast trade in July (lat. 10° N.) are in the latitude of southern Trinidad, and the northern limits of the southeast trade are at about latitude 6° N., just off the coast of Dutch and French Guiana. The ship encountered no "equatorial calms" during her two crossings from trade belt to trade belt, nor was there any really normal doldrum weather. The winds remained light to fresh from easterly points, and the weather was fairly typical of the trades, with some squalls. It will be remembered that typical doldrum conditions are not, as a rule, characteristic of this part of the western North Atlantic, and that the chances of finding light winds and calms are considerably fewer here than in the equatorial low-pressure belt off the west coast of Africa.

Those who think that steaming in the trades is monotonous can have little appreciation of the ever-changing panorama of the clouds. There are those wonderfully bright days when the blue skies are dotted with typical trade cumuli, their tall columnar forms leaning over to leeward, their tops breaking off and drifting away, dissolving as they go, and being replaced by new tops. There are days when conditions favor more active cloud growth, when cumulo-nimbus is the characteristic cloud form, when the skies are darker, when there are brief showers accompanied by slight squall winds—almost typical doldrum conditions. There are also dull days, when the skies are gray, and one is reminded of overcast days at home; and there are days when the sky is clear from morning to night. Surely, the sea traveler with his eyes open should never complain of monotony in the trades. These variations in the types of clouds and in the amounts of cloudiness are puzzling, in view of the fact that the air temperatures, the relative humidities, and the wind direction and velocity observed on board ship do not vary appreciably on days of widely different cloud conditions. The explanation is doubtless to be found in varying conditions aloft. The writer has spent, in all, several weeks in the trades, in North and South Atlantic, North and South Pacific, and in the Indian Ocean, and he has never failed to find interest and variety in the ever-changing cloud forms. On this voyage he was again impressed by the growth of the trade cumulus and rudimentary cumulonimbus in the later afternoons and early evenings, often to the shower stage. These growing cloud tops, illuminated by the setting sun, are beautiful to watch. Increased convectional ascent as the sun goes down is doubtless due to radiation from the tops of the clouds themselves.

Temperature observations on board ship were made in the shade, in well-ventilated locations, by sling thermometer. They ranged, roughly, between 75° and 85° most of the time, rising very slowly toward the south, where the readings during the daytime and early evenings remained steadily about 83° to 85°. The relative humidity was high and the air on shore was distinctly of the "hot-house" type. Under such conditions, walking in the narrow streets, under the tropical sun, and out of the wind, was always extremely uncomfortable. On the other hand, relief could always be found on board the ship, even when she was at anchor, because of the light or fresh breeze which was practically always present. The maximum observed on board was 86.5°. The official maximum on land was 90.2° (Bermuda). The most uncomfortable conditions on board ship were felt when the anchorage was close inshore, in the lee of hills that cut off the refreshing trade winds. Forced ventilation was used during the whole trip, and in addition electric fans were in constant operation in staterooms.

There were no gales; there was no fog after leaving the Massachusetts coast; there were no hurricanes. Those who dread the storms, gales, fogs, rough seas, and changeable weather of the much-traveled northern North Atlantic will find the poetry and charm of the ocean in the uniformity of temperature, bright skies, smooth fogless seas, and gentle trade winds of the Tropics. The complete meterological ignorance of the average passenger was illustrated time and again by such remarks as "how lucky we are to have such a fine breeze"; or "it is fortunate that the sea is so smooth"; or "I hope we shall have no fog".

BERMUDA

The Bermudas are in reality a modified coral atoll, resting on a submarine mountain. These coral islands lie farther north than any others of similar origin, a fact due to their position in the warm waters of the Gulf Stream eddy.

> By the gay borders of Bermuda's isles
> Where spring with everlasting verdure smiles.

So runs the poet's climatic summary. The mild and equable climate, accessibility, extensive advertising, and other factors, have combined to make Bermuda an increasingly popular winter resort. The winter months are and will remain the most alluring season; the summer, so far as maximum temperatures are concerned, is not as hot as are our own hot waves, but the cool spells brought by our summer "cool waves" and by our cyclonic onshore easterly winds along the Atlantic coast are wholly lacking. The marine type of retarded maximum and minimum temperatures is clearly indicated. August is the warmest month (mean slightly over 80°) and February or March the coolest (a few degrees over 60°). In an average winter the thermometer does not fall below 40°,

and is oftener near 60° than 40°. In summer, the maxima are oftener below than above 90°. Frost and snow form no part of the picture.

The Bermudas lie throughout the year in the western portion of the North Atlantic anticyclone. The mean wind direction is southwest, somewhat more northerly in winter and more southerly in summer. The winter winds are tempered by the warm waters over which they blow. On the other hand, the prevailing wind of summer imports high temperatures which one writer has described as "oppressive heat" between July and October, especially in August, and as resembling a "vapor bath". People who have lived for years in the fresh trade winds of the West Indies report Bermuda as seeming much the warmer and more enervating, especially at night. Bermudians, however, maintain, and rightly so, that they have a more equable summer climate, with less high maxima, than is found over much of the United States.

Occasional hurricane winds, and not infrequent winter gales, are irregular visitors. The rainfall is moderate. Hamilton has slightly over 50 inches, with maxima in January and April. There is greater probability of rain in winter, when extra-tropical cyclonic storms reach the islands, and less in early summer. The main source of water is rain caught in cisterns. During the past winter, water was brought from the United States to supply the needs of the winter visitors. The relative humidity remains between 70 per cent and 80 per cent throughout the year.

The vegetation of Bermuda is less characteristically tropical than that of the Antilles. The rainfall is less and the winters are cooler. Many tropical fruits and economic plants are, however, successfully cultivated. Bermuda is famous in the United States for its early vegetables, especially potatoes, its onions, and its Easter lilies.

The local weather reports for the two days preceding the writer's first visit showed clear to fair skies, maximum temperatures of 84° and 85°; minima of 75° and 76°. The temperatures of late afternoon and evening on board were 77.5° and 76.5°, respectively. The local newspaper reported: "There has been a strong southerly wind all of the past week, so that yachting and boating of all kinds in the Great Harbour has been difficult and unpleasant." On the second stop, the skies were cloudless, the wind light northerly, and the temperatures on board (8 a. m. to 1 p. m.) between 82° and 84°. The official record for August 3 was as follows: Maximum, 90.2°; minimum 74.2°; rain, 0.00 inches; barometer, 30.15 inches (a. m.) to 30.13 inches (p. m.); mean wind velocity, 17 miles an hour; sunshine, 9 hours, 20 minutes.

THE LESSER ANTILLES

The volcanic islands of the British Lesser Antilles all have certain common characteristics, and present much the same general appearance. They owe their picturesqueness, as well as their fertility, to their volcanic origin. Their mountains are sometimes symmetrical volcanic cones; sometimes rugged peaks and sharp serrated ridges; sometimes only gently rolling hills. There is usually one dominating volcanic summit, like Mount Misery on St. Kitts, the Soufriére on Montserrat, the Morne Diablotin on Dominica, again a Soufrière on St. Vincent, rising to between 3,500 and somewhat over 5,000 feet above sea level. Dense forests cover the slopes and reach up to the tops of most of the mountains, while over the lower slopes and in the fertile valleys stretch the cultivated fields, with their pleasing variety of different shades of green, broken here and there by the dark rich soil of freshly-tilled patches awaiting the next crops and by picturesque coconut, mango, and banana groves. Very beautiful everywhere are the brilliant colors of the many tropical flowers, notably poinsettia, hibiscus, bougainvillea, royal poinciana, and lilies of various sorts. Only a small portion of any of the islands is cultivated.

Climatically, all the islands are essentially alike, as has been indicated in the introductory summary. All have wetter windward and drier leeward sides. All have cloud caps and cloud banners over their higher mountain tops. All show typical diurnal-cumulus cloud development, and, especially in the afternoon and evening, have local showers from their massive cumulo-nimbus clouds. All have essentially the same vegetation and agricultural products. In all of them the capital and chief port is on the leeward side, where the water is smooth. From a shipping point of view the advantage of such a location is obvious. The disadvantage is that the velocity and steadiness of the trades are considerably decreased, and the feeling of heat is greater.

In size the various islands visited range from 30 to 300 square miles in area. Some of them are so close together that two were visited on the same day, with a stop of several hours at each island. Taking the Lesser Antilles in sequence from north to south they average only about 30 miles apart.

The early prosperity of the West Indies was built on sugar, cultivated by slave labor. After the abolition of slavery, with a large negro population no longer compelled to do hard work, a distinct decline began. Further, the present depression in the sugar market, resulting from overproduction of cane and beet sugar, has had most unfortunate economic consequences in the West Indies. In fact, it is probably no exaggeration to say that the large majority, if not all, of the islands are in a state of stagnation, if not of still progressive decay. Sugar, molasses, and rum still lead the list of agricultural products in most of the islands visited. Coconuts, coconut oil and copra, cocoa, limes, bay rum, arrowroot, mangoes, bananas, bread fruit, sweet potatoes, Indian corn, spices, etc., are also characteristic products. The islands differ considerably in their individual products, and details concerning the special products of each island would be wearisome and of no value in the present article. The cargo picked up by the ship at the different ports and landed at other ports, showed clearly that the products are not all alike. It was noticeable that the Demarara rice was brought north to several of the islands, and that mangoes, limes, avocado pears, and coconuts were shipped to Barbados, Bermuda, and Canada. The efforts now being made throughout the islands to find new crops and other substitutes for sugarcane are almost pathetic. On one island the development of a livestock industry, in another the raising of vegetables for the Canadian winter market, in another the planting of cocoa, in another the cultivation of citrus fruits—these are more or less random illustrations of hopes which are held for future success. The government agricultural departments are doing their part in experimental work with various plants and crops, as may be seen on a small scale in the botanical gardens in Dominica, St. Lucia, and St. Vincent. The experiment-station work in Barbados and Trinidad and in Georgetown (British Guiana) has already accomplished important results, and is full of promise for the future. Small wonder is it that the British West Indies are very seriously agitating federation, accompanied by complete dominion status, and that every effort is being made to cultivate reciprocal trade relations with Canada. The regular service maintained by the Canadian National

Steamships is striking evidence of the increasing closeness of these relations with Canada. Every automobile seen in the islands was "made in Canada."

St. Kitts, the first of the Leeward Islands visited on the voyage south, is the oldest British settlement in the West Indies. From Basseterre, its chief town, there is a good series of meteorological records. Of St. Kitts one writer has said: "The bracing qualities of the atmosphere are portrayed in the general good health of the inhabitants. The mornings and evenings of the hottest days are agreeably cool." Yet another has said: "Basseterre is not the most healthful (place) in the islands, but from November to May or June it is safe to live in." Very beautiful were the cumulus clouds on Mount Misery, forming and dissolving in the fesh trade winds, and very easy was it to determine the prevailing wind direction by means of the rows of windblown coconut palms in exposed locations.

Nevis has a name of meteorological origin, wrongly applied. Columbus named it Nieve in 1493 because of the white clouds which he saw enveloping its highest mountain, a cloud cap the same in appearance to-day as it was when Columbus first saw it. Nevis, once the social center of the West Indies, the birthplace of Alexander Hamilton, and the island on which Lord Nelson was married, is to-day a mere economic ghost of its former self. There is a vivid recollection of a drive around Nevis on a brilliant afternoon; of the marked difference between the vegetation and general condition of the population on the leeward and windward sides; of abandoned sugar mills and shacks on formerly prosperous estates; of ancient stone windmills now falling to ruins; of the smoke from dry cotton plants burned after the harvest; of the fires of the charcoal burners on the mountain. That Nevis is within the hurricane belt was evidenced by the coconut palms lying prostrate as the result of the 1928 hurricane, and by the fact that the windmills still in use in harvest time had had their "sails" removed in anticipation of the coming hurricane season.

Antigua the seat of government of the British Leeward Islands colony, has less elevation than the other volcanic islands, and this fact is inevitably reflected in the relatively small rainfall. The maximum altitude in the Shackerley Mountains is 1,500 feet. A pleasing variety of rolling hills and cultivated valleys is the feature that strikes the tourist as his ship enters the open roadstead of St. Johns and anchors 2 or 3 miles offshore. The excursion to English Harbor is full of historical interest. Here Nelson and Rodney careened and refitted their ships. Here may be seen the old dockyards, barracks, shipbuilding sheds, cannon, anchors and anchor chains, ships' figureheads, and other naval relics of olden days. The drive to English Harbor also gives an excellent cross section of the agricultural activities of the people.

W. H. Alexander has written of Antigua:

> Owing to a light rainfall, the elevated portions of the island are not clothed with the luxuriant tropical vegetation to be seen in other of the Leeward Islands, such as St. Kitts, Montserrat, and Dominica, but presents to the eye a rather desolate, uninviting appearance, The valleys, however, stand in marked contrast to the hills, being arrayed in all the beauty and vernal richness of a tropical climate. There are no rivers, and but few springs, and these are brackish. The people are dependent upon rainfall for a water supply, and have in former times suffered great loss and inconvenience from droughts.

The lack of any considerable elevations which would force the trade winds to climb higher, and thus cause more condensation, is the obvious reason for the relative dryness. One of the picture post cards on sale in St. Johns shows government officials supervising the rationing of water in a native village during a drought. On the other hand, another writer says:

> Antigua is so generally spoken of as a dry-as-dust place, where the earth refuses to yield water for the use of man, that I received more than ordinary pleasure in gazing on the wooded hills and green vales which decorate the interior of the island. (H. Coleridge: "Six Months in the West Indies in 1925.")

The historical records of Antigua mention damage by hurricane winds at none too infrequent intervals.

On Montserrat the traveler, especially one in search of climatic responses, should take the motor drive from Plymouth across to the windward coast. In some respects there are similar contrasts to those seen on the famous Pali drive from Honolulu, but the latter is far more beautiful and impressive. Ascending by a good motor road from Plymouth, the terraced hillsides show intensive and effective cultivation. Cotton, grown even well up on the lower slopes, and Indian corn are here the chief crops. Breadfruit, sweetpotatoes, and cassava are also seen. At the highest point on the road, where there is a beautiful view over the ocean to the east, the trades are found blowing with added velocity, and the great dark rolls of cumulus and cumulo-nimbus clouds on the windward slopes and on the tops of the mountains are beautiful illustrations of the effects of the forced ascent of the trades. "Montserrat lime juice" was formerly the chief product of the island, and is still widely known, but of late years the lime-fruit industry has fallen off.

Wonderfully beautiful were the great masses of cumulo-nimbus clouds towering above the mountains of Dominica as the ship neared that island in the early morning, the tops of the clouds brilliantly illuminated by the rising sun, while below, in shadow, the dark gray and purplish colors stood out in marked contrast. The elevation of Dominica insures abundant rainfall. There are said to be 365 rivers on the island. Many old plantations formerly devoted to sugarcane are now being planted with limes, coco, and spices. The exports from Roseau on the day preceding the arrival of the *Lady Hawkins*, as reported by the customhouse, were cocoa, copra, ginger, bay oil, and fruit. Hurricane winds have been responsible for great damage to the trees, coconut palms in particular. C. W. Bellamy has written:

> The relaxing, enervating moisture of the air, the scorching, blazing heat of the sky, or the parching drought of the winds * * * are alike unknown in Dominica. * * * Hot days in the height of the summer season are only to be expected in these latitudes.

To the truth of the latter sentence the casual traveler who walks through the narrow streets of Roseau on a bright July day will certainly testify. In the local newspaper there were advertisements of hurricane insurance, and, "for the hurricane season," hurricane lanterns. A letter to the editor, referring to the government notices regarding hurricane precautions and hurricane relief measures, expressed regret that so much publicity was being given to this subject because of the unfortunate reaction in the minds of those who might be thinking of settling in the island.

St. Lucia is the largest and most northerly of the British Windward Islands. Castries, the chief town, lies on a deep and well-protected harbor, one of the finest in the West Indies. It was formerly a very important coaling station, but has lost its commanding position since the opening of the Panama Canal and the advent of oil-burning steamers. It is picturesque, but dead. Its few white inhabitants fly to the cooler hill slopes at night. From the wireless station, 800 feet above Castries, with its abandoned barracks, occupied by Canadian troops during the World War, a beautiful view of the island is obtained, including some prosperous and well-kept cane fields. As far back as 1650 tobacco,

ginger, and cotton were raised here, later to be replaced by sugarcane and coco. "Among all these beautiful islands," wrote Kingsley in "At Last," "St. Lucia is, I think, the most beautiful."

The most easterly of the West Indies is the low coral limestone island of Barbados, "the land of abiding sunshine," exposed to the full force of the northeast trades, famous for its remarkably equable and healthful climate. In contrast with the volcanic islands, the maximum elevation in Barbados is under 1,200 feet. Early devoted to sugar cultivation, the English planters of "Little England" developed large sugar estates and made fortunes. And Barbados, although it has suffered financially from the depression in the sugar market, has managed to remain more prosperous than many of its sister islands. Ninety per cent of the land under cultivation at the present time is devoted to sugarcane, but during the past few years there has been increasing planting of vegetables (tomatoes, potatoes, carrots) for the Canadian market. The fact that there is little or no individual ownership of land by peasant proprietors has forced the negro laborer to be dependent for his livelihood on work provided on the large estates. Where the West Indian negro has his own field to cultivate, he manages to survive with a minimum amount of labor.

Bridgetown lies on the shore of an open roadstead (Carlisle Bay) on the southwest of the island. It has always been a crossroads for marine traffic. Here Washington, with his brother Lawrence, stayed in 1751. Well known in the history of meteorological observations are the rainfall records, kept several decades past, at numerous stations in Barbados. These observations were undertaken in connection with the cultivation of sugarcane, and Governor Rawson's discussion of them in making forecasts of the sugar crop became a meteorological classic. A stay of several hours in the harbor of Bridgetown gave an opportunity, not provided on two previous visits to Barbados (1908, 1910), of taking a motor ride of many miles through the wonderfully cultivated country districts, of which the tourist who spends his time shopping in the city or bathing at the Aquatic Club has no conception. Sugar has long been king in Barbados, and in spite of the depression now existing in the sugar market still holds almost undisputed sway in the island. It was a typical Barbados day, with fleecy cumulus clouds traveling rapidly in the wind, with several short but heavy tropical showers to give variety to the scene, and with the soft trade blowing steadily. For mile after mile there were fields of sugarcane, waving in the wind, dotted with sugar factories and native villages, and here and there one of the original planters' country estates, inclosed by high stone walls, and surrounded by groves of mahogany, coconut palms, mangoes, bananas, breadfruit, all enlivened by the brilliant colors of hibiscus, bougainvillea and other tropical flowers. Very picturesque are the old stone towers of the windmills of earlier days, testifying to the importance of the strong and steady trades, and now unfortunately replaced by buildings containing modern machinery run by steam power. Indian corn, sweetpotatoes, cassava, yams, and other crops gave a pleasing variety to the scene, and from the occasional slight elevations wonderful views of the ocean, and of the trade surf rolling in on the windward coasts, combined to make a picture not easily forgotten.

Barbados is so low an island that the trades sweep across it with hardly an obstruction and with scarcely diminished velocity. Every tree of any height at all is wind blown, and every variety of distortion of trunk and branches and crown may be seen. The traveler on the deck of his steamer in Carlisle Bay may well rejoice that Barbados is flat, for across the bay at all times the strong trade wind brings refreshing relief after the hot streets of Bridgetown. Temperatures taken on board ship, at various hours during the day, varied only from 81.5° to 84°. On the return voyage at Barbados the temperature on board ship was below 85°, and the radio news reported a hot wave with a maximum of 97° in Boston.

St. Vincent has been described as one of the loveliest and least known of the Lesser Antilles. Its volcano, Soufrière, in the eruption of 1902, caused the loss of over 2,000 lives. Another famous historical eruption occurred about a century earlier (1812). Ashes from St. Vincent fell on Barbados, about 100 miles to windward, not, as a well-known West Indies guidebook explains the phenomenon, because of the terrific nature of the explosion, which drove the débris against the trades. At Kingston, the capital and chief port, the mean annual range of temperature is only 3.5°. The botanical garden, small but well cared for, claims to be the first of its kind established in the Americas for the propagation of plants "useful in medicine and profitable as articles of commerce, and where nurseries of the valuable productions of Asia and other distant parts might be formed for the benefit of His Majesty's colonies." Breadfruit, introduced in 1793, has prospered greatly. Cloves were brought from Martinique in 1787 and nutmegs from Cayenne in 1809. The tourist who sees only the port of Kingstown and the charming view of the wooded hills and cultivated fields from Fort Charlotte would never suspect the presence of volcanic activity as recent as that of 1902. The fact that the rainy season was beginning was emphasized by overcast skies and frequent showers. The maximum temperature on shipboard was 83.5°.

Grenada, the last and southernmost of the volcanic Caribbees (lat. 12° N.), has been called "the Spice Island of the West." Cocoa and spices here replace sugar, and fresh fruits and vegetables are shipped to Barbados and Trinidad. The Grenadians boast of the fact that Trinidadians come to Grenada in search of a cooler climate than their own. St. George, with its steep and narrow streets, sometimes terminating in a flight of stone steps, recalls many Italian cities. The local newspaper contained two advertisements which were of interest. One read: "Be prepared for the rainy season," and recommended raincoats, mackintoshes, tweed overcoats, and galoshes. The other bore out the reputation of Grenada as the "spice island" in the notice: "Be sure to get the best value for your cocoa, nutmegs, and mace by selling to —— & Co. (Ltd.)."

TRINIDAD

Physically, Trinidad (1,750 square miles), belongs to South America. The two east-west mountain ranges which border it on its northern and southern margins are a continuation of the northern and southern ranges of Venezuela. These mountains almost inclose the Gulf of Paria, which separates Trinidad from the mainland. The narrrow straits on the north and south are the famous Dragons Mouth and Serpents Mouth. Through the Dragons Mouth (an imposing gateway) Columbus sailed when he discovered Trinidad, and through that northern gateway steamers now pass on their way to and from Port of Spain, "the Queen City of the Antilles," situated on the gulf at the northwestern corner of the island. In these narrow straits the mountain ranges are submerged, leaving a navigable channel. As one writer has expressed it, here "the long attenuated finger of Venezuela points

to the British Colony." Seen from the ocean, or the Gulf of Paria, Trinidad does not differ much in general appearance from the other islands, although none of its mountains are as high as the higher volcanic peaks of the Lesser Antilles. Nor are the products of the soil different. Sugar, molasses, rum, cocoa, coconuts, copra, etc., are leading articles of export. The famous "Pitch Lake" at La Brea has been known from early days. Here Sir Walter Raleigh, in 1595, secured pitch for calking his ships, and here the buccaneers also calked their ships. This asphalt lake covers about 90 acres; and although enormous quantities of asphalt have been removed, there seem to be no signs of exhaustion. The trip to the Pitch Lake was easily made by automobile from San Fernando, where the steamer called for cargo (sugar). An excellent asphalt road takes the traveler through a large sugar plantation, groves of coconut palms, and tropical forests, interspersed with many picturesque, if squalid, collections of huts inhabited by East Indians. Before reaching La Brea an oil field is passed through, with the somewhat novel sight of oil derricks standing in a tropical jungle. The lake itself, with its gray surface covered here and there with pools of water, is disappointing. On the other hand, there is the interest of its immense value, of its inexhaustible supply of asphalt, of the well-kept grounds and buildings of the company, and of the endless chains of buckets which carry the barrels of asphalt directly onto the jetty and load them onto the waiting steamers. Heavy tropical showers fell at intervals and the "patchy" character of the rains could easily be noted by the succession of wet and of dry sections of the road. Under overcast sky, after a thunderstorm off San Fernando, the temperature fell to 80.5° from 85° (2 p. m.). The local newspaper reported that the La Brea district was swept by a severe rainstorm and that the entire Pitch Lake was under water.

Trinidad, about 10° north of the equator, inevitably has a truly tropical climate, moderated by the trades. Port of Spain has a mean annual temperature of about 77°. January (about 75°) is the coolest month, and May the warmest (about 79°). The highest temperatures come before the rainy season, as in a monsoon climate. Extremes at Port of Spain are 100.4° and 57.2°. Relative himidity is always high, over 80 per cent in the rainy and about 75 per cent in the dry season. The rainfall is heaviest (over 120 inches) to the east of the northern mountains, and least (under 60 inches) on the shores of the gulf, on the west. The "rainy season" comes between June and December, with a primary maximum from June to August and a secondary in November. No month is wholly dry. The trades are distinctly weakest in the rainy season; in the dry season of "winter" they blow with full strength all across the island. Where freely exposed to the trades, cocoa trees are protected by wind breaks.

An umbrella was doubly useful during the few hours spent ashore at Port of Spain as protection against a very hot sun and again during the sudden tropical showers which fell at intervals. A visit to the local Weather Bureau station on the roof of the building of the harbor constabulary gave opportunity to look over the daily records and the sheets of the self-recording instruments. At noon, the hour of the visit, the dry bulb in the shelter was 88°; the wind very light from northeast. On the previous day the official readings were: 7 a. m., dry 74°, wet 73°; 3 p. m., dry 87°, wet 80°; maximum, 88°; minimum, 71°. A wet-bulb reading of 80°, it may be noted in passing, has been set by one writer as the limit beyond which physical labor by the white race is impossible. On the return voyage the official readings at Port of Spain were as follows: 7 a. m., dry 72°, wet 71°, 3 p. m., dry 79°, wet 77°; maximum, 89°; minimum, 71°; bright sunshine, 5 hours 38 minutes; wind, northeast. The damp heat of "summer" is very trying, certainly to a northerner. The "winter" months are surely more bearable, because of a lower sun, stronger trades, and cooler nights. Respect for the sun is shown by the fact that automobiles are parked on one side of the street before noon and on the opposite side after noon, the parking side being the shady one. The botanical gardens are very fine and beautifully kept up. The varieties of trees and plants of economic value are surprisingly large. Indeed, one need not go to the primeval forests of Trinidad, so wonderfully described by Kingsley in At Last, to see examples of all the important native forest trees.

Sailing from Port of Spain in the late afternoon, the passage through the Dragons Mouth gave wonderful views of the Venezuelan mountains on the west and the Trinidad mountains on the east, covered with heavy cumulo-nimbus clouds. Later, the surf dashing against the rocky shores of the north coast of the island and the dark rain squalls moving across the hills showed clearly enough why the windward coasts are so deserted and why they are still so heavily forested. Here the trade wind, not man, is master.

DEMARARA (BRITISH GUIANA)

The casual traveler who spends a day or so in Georgetown (Demarara) can see nothing of the great hinterland of British Guiana, with its plateaus and mountains, its vast primeval forests with their variety and abundance of animal, bird, plant, and insect life, its open savannas, its great rivers, its cataracts and waterfalls, its wealth of diamonds and gold and other valuable minerals, and its famous Mount Roraima. The flat alluvial coastal lowland, a narrow strip only a few miles in width, "was once nothing more than a mangrove swamp in front and a sedgy morass behind." The Dutch, the first European owners of the country, reclaimed most of the low coastal belt by means of sea walls, dykes, and dams and laid it out in sugar and cotton plantations, crisscrossed by canals and drainage ditches. Cotton was long ago abandoned and sugar became king. This coast, reclaimed from the sea and the forest, is practically the only inhabited and cultivated part of British Guiana, "the Golden Crown of South America," where Sir Walter Raleigh sought his El Dorado.

Georgetown, or Demarara, lies on the right bank of the Demarara, at its mouth, and also has frontage on the ocean. Lying below sea level at high tide, it is protected by a massive sea wall and is drained by canals and sluices, pumped by steam. The houses are raised above the ground on stone, concrete, or wooden posts. For at least two hours before reaching port the ocean is discolored by the mud brought down by the numerous rivers supplied by the heavy rains. "Few countries on the surface of the globe," wrote Sir R. H. Schomburgk, "can be compared with Guiana for vigor and luxuriance of vegetation. A constant summer prevails, and the fertility of the soil, the humid climate, and a congenial temperature insure a succession of flowers and fruits; in a person accustomed to the sleep of nature in the northern regions, where vegetation is deprived of its greatest charms, the leafy crown and the fragrant blossoms can not but raise astonishment and admiration."

The hot, steamy atmosphere of the Guiana coast is not exactly a white man's climate. By means of inden-

tured East Indian coolie labor, a plan now abandoned, the cultivation of sugar cane was here brought to a high state of perfection and of financial profit. With the lack of forced labor and the depression in the sugar market, British Guiana is turning more and more to rice and other crops under the skillful and tactful guidance of the agricultural department.

Meteorological observations have been kept at Georgetown (lat. 6° 50′ N.; long. 58° 12′ W.) for many years, first at the observatory and later (since 1882) in the botanical garden. The mean annual temperature is between 79° and 80°, with an annual range of 2.3°. The mean maxima range between 83° and about 87°, according to the season, and the mean minima between 74.°7 and 75.7°. The absolute maximum is 91.9°; the absolute minimum, 68°. The rainfall is heavy (85 inches in round numbers), and there is a double rainy season, May-August and December-January, with a long "dry" season in September-October and a short "dry" season in February, occasionally in March or April. Calms and light variable winds are most frequent in the primary wet season, which is normal and obviously controlled by the equatorial rain belt. The "winter" rainy season is abnormal and puzzling and its explanation has been much debated. The prevailing winds in the "low-sun" season blow more steadily and more directly on shore (northeast trades). The mean monthly rainfalls in June and in December are 12 inches and 11.5 inches, respectively, and in September and October 2.75 inches and 2.36 inches, respectively. The fact that during so much of the year the wind is on-shore is a great boon to Georgetown. The number of rainy days is 23 to 24 in June, 20 in December, 16 to 17 in February and March. The relative humidity is always high (75 to 80 per cent). Hurricanes never occur and high winds are very rare.

When one thinks of the Guianas there inevitably come to mind the horrible stories of the excessively high death rates among the convicts in French Guiana. As some one has said, "French Guiana was conveniently endowed with an unhealthy climate," and another has written: "Perhaps it is its fatal climate which has won for French Guiana its chief fame as a convict settlement." It is true enough that the disease and death rates in all the Guianas have in the past been alarmingly high, but "the man behind the climate," in British and Dutch Guiana especially, is winning out by means of modern sanitary and medical precautions. So successful has been the fight that Knoch has recently written, "to-day life on the coast, from the standpoint of health, offers no special dangers." That the steady "hothouse" air and the heavy rainfall are very trying to white men there is no doubt, but with free exposure to the wind, protection against the sun, and reasonable precautions life is not precarious.

Two of the most profitable and interesting days of the trip were spent in Georgetown. Through the courtesy of the agricultural superintendent of British Guiana, Mr. Peterkin, the many activities of the department of agriculture were fully explained. About 60 acres in connection with the botanical gardens are devoted to the experimental cultivation of many varieties of rice and of other crops. Thoroughly up-to-date methods of the selection and treatment of the different crops are employed in laboratory and field. The remarkable herbarium of British Guiana plants was also visited, and a leisurely inspection of the meteorological station, now located in the botanical gardens, well repaid the trip to Demarara. Windvane and 4-cup anemometers, self-recording, are on the roof of the 2-story building which also houses the herbarium. The Richard barograph is on the ground floor, as is the thermograph, the latter in a window shelter. Outside, in an inclosed rectangle, are the various outdoor instruments; the thermometers, wet and dry, in a Stevenson screen; evaporation tank; soil thermometers; radiation thermometer; Campbell-Stokes sunshine recorder; black bulb in vacuo; ordinary 8-inch gage and a Negretti and Zambra hyetograph. The exposure is excellent. One of the two days in Georgetown brought several short, light showers, and one heavy rainfall of about 0.80 inch in an hour and a half, accompanied by a sharp squall. The second day was clear to fair without rain. The heat was intense, but was relieved whenever there was a breeze, and beginning about sunset there was enough cooling to be noticeable and refreshing. On the day of landing the official record was as follows: 6 a. m., 74°; noon, 85°; 6 p. m., 81.5°; midnight, 81.0° maximun, 87°; minimum, 73°; maximum in sun 148°; minimum temperature on grass, 72°; wind velocity, 8 a. m. to 6 p. m., 4.5 miles an hour; 6 p. m. to 8 a. m., 1.78 miles an hour; maximum velocity, 7.5 miles an hour; rainfall, 12:05–12:10 p. m., 0.17 inch. On the following day the incomplete record showed: 6 a. m., 77°; noon, 79°; maximum, 85°. These few data serve to show the general character of successive days near the close of the primary rainy season in Demarara. The only appreciable variation from day to day is in the amounts of rainfall.

The return voyage from Georgetown gave opportunity to renew acquaintance with the weather types and climatic controls noted on the outward voyage. From Georgetown to Bermuda the barograph curve rose very slowly, day after day, on the weak pressure gradients, the highest reading (about 30.10 inches uncorrected) being recorded at Bermuda. The diurnal variation continued to beyond latitude 30° N., and faded away in the Bermuda area. Near the northern limits of the northeast trade calms were encountered and continued to Bermuda. The percentages of calms in the "squares" south and east of Bermuda in July are fairly high (15 to 19 per cent), as is to be expected on the weak pressure gradients over that part of the ocean. The two days in the westerlies between Bermuda and Boston brought a characteristic "temperate" zone variety of weather: Variable winds, mostly southwesterly, the first westerly winds in a month; mostly overcast skies; an early morning thunderstorm; near the New England coast some fog, the first fog since leaving this same area on July 9. The temperature, which had remained steadily over 80° on board ship throughout the voyage, fell below that point with fresh northeast winds a day west of Bermuda. Martinique, passed at night on the outward voyage, was clearly seen on a bright afternoon on the homeward trip. Great cumulus masses covered the mountain tops and rolled down the leeward slopes. Not until the ship was to the north of the island could the "steam-smoke" column rising from the summit of Mont Pelee be clearly seen. The vertical height to which this column rose varied. The top of it was turned to the westward by the trades.

Addendum.—The foregoing account of my month's cruise among the Lesser Antilles hardly includes all that was found in the way of meteorological and geographical interest. It is my chief hope that what I have written may stimulate some of my fellow teachers to go "weather hunting" away from home.